Achieving Vision Zero
A Safe Systems Approach to Transportation Planning and Design

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Vision Zero Cities

A Vision Zero City meets the following minimum standards:

- Sets clear goal of eliminating traffic fatalities and severe injuries
- Mayor has publicly, officially committed to Vision Zero
- Vision Zero plan or strategy is in place, or Mayor has committed to doing so in clear time frame
- Key city departments (including Police, Transportation and Public Health) are engaged.

Updated
January 2018
Conventional Wisdom: 90% of all crashes are attributable to driver error.

Table 1. Driver-, Vehicle-, and Environment-Related Critical Reasons

<table>
<thead>
<tr>
<th>Critical Reason Attributed to</th>
<th>Estimated Number</th>
<th>Estimated Percentage* ± 95% conf. limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drivers</td>
<td>2,046,000</td>
<td>94% ±2.2%</td>
</tr>
<tr>
<td>Vehicles</td>
<td>44,000</td>
<td>2% ±0.7%</td>
</tr>
<tr>
<td>Environment</td>
<td>52,000</td>
<td>2% ±1.3%</td>
</tr>
<tr>
<td>Unknown Critical Reasons</td>
<td>47,000</td>
<td>2% ±1.4%</td>
</tr>
<tr>
<td>Total</td>
<td>2,189,000</td>
<td>100%</td>
</tr>
</tbody>
</table>

*Percentages are based on unrounded estimated frequencies (Data Source: NMVCCS 2005–2007)

Source: NHTSA, 2015
**Driver Error**

- **Recognition error**, which may include driver inattention or distraction, as well as inadequate surveillance for oncoming hazards before entering an intersection of making a lane change.

- **Decision error**, such as driving too fast for conditions or misjudging gaps in oncoming traffic.

- **Performance error**, such as poor directional control over the vehicle prior to a crash, a factor most often attributable to drowsy driving.
Psychological Process

**Counterfactual Reasoning:** A form of logic that falsifies antecedents to determine whether they negate consequences.

Form:

Antecedent $\rightarrow$ Consequence
**The Simulation Heuristic**

**Outcome Closeness:** We focus on antecedents that are immediately proximate to consequences.

**Outcome Normality:** Exceptional outcomes are presumed to follow from exceptional antecedents. We construct counterfactuals that shift the exceptional antecedent to its “normal” value.

**Extant Norms:** Counterfactual content is based on social norms of expected behavior (which are modifiable and socially constructed).

*Source: Roese, 1997*
“Blaming individuals is more emotionally satisfying than targeting institutions.”

- James Reason
Conventional Safety Approach

Individual

Errors and Violations

“Active failure”

Engineering Defenses

Passive safety features:
- Forgiving geometry
- Clear roadsides

Crashes
SAFETY DOESN’T HAPPEN BY ACCIDENT.

www.AlertTodayFlorida.com

WHEN DRIVING, WALKING, OR BICYCLING...
PAY ATTENTION.
READ THE SIGNS.
LEARN THE RULES.

AVOID DISTRACTIONS.
STOP BEFORE TURNING RIGHT ON RED.
USE THE SIDEWALK AND CROSSWALKS.
BICYCLE PREDICTABLY, WITH TRAFFIC.
EYES ON THE ROAD
DON'T DRIVE DISTRACTED
# Application of Counterfactual Reasoning

<table>
<thead>
<tr>
<th>Factors</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Failure to yield right of way</td>
<td>216</td>
<td>25.7</td>
</tr>
<tr>
<td>Not visible (dark clothing, no lighting, etc.)</td>
<td>87</td>
<td>10.4</td>
</tr>
<tr>
<td>Failure to obey traffic signs, signals, or officer</td>
<td>83</td>
<td>9.9</td>
</tr>
<tr>
<td>Under the influence of alcohol, drugs, or medication</td>
<td>53</td>
<td>6.3</td>
</tr>
<tr>
<td>Making improper turn</td>
<td>43</td>
<td>5.1</td>
</tr>
<tr>
<td>Improper crossing of roadway or intersection</td>
<td>39</td>
<td>4.6</td>
</tr>
<tr>
<td>Operating without required equipment</td>
<td>31</td>
<td>3.7</td>
</tr>
<tr>
<td>Wrong-way riding</td>
<td>31</td>
<td>3.7</td>
</tr>
<tr>
<td>Failure to keep in proper lane or running off road</td>
<td>22</td>
<td>2.6</td>
</tr>
<tr>
<td>Riding on wrong side of the road</td>
<td>20</td>
<td>2.4</td>
</tr>
<tr>
<td>Inattentive (talking, eating, etc.)</td>
<td>17</td>
<td>2.0</td>
</tr>
<tr>
<td>Daring or running into road</td>
<td>16</td>
<td>1.9</td>
</tr>
<tr>
<td>Improper or erratic lane changing</td>
<td>15</td>
<td>1.8</td>
</tr>
<tr>
<td>Failing to have lights on when required</td>
<td>8</td>
<td>1.0</td>
</tr>
<tr>
<td>Physical impairment</td>
<td>7</td>
<td>0.8</td>
</tr>
<tr>
<td>Vision obscured (reflected glare, parked vehicle, sign, etc.)</td>
<td>6</td>
<td>0.7</td>
</tr>
<tr>
<td>In roadway improperly (standing, lying, working, playing)</td>
<td>5</td>
<td>0.6</td>
</tr>
<tr>
<td>Making improper entry or exit from trafficway</td>
<td>4</td>
<td>0.5</td>
</tr>
<tr>
<td>Ill, blackout</td>
<td>3</td>
<td>0.4</td>
</tr>
<tr>
<td>Improper passing</td>
<td>3</td>
<td>0.4</td>
</tr>
<tr>
<td>Traveling on prohibited trafficways</td>
<td>2</td>
<td>0.2</td>
</tr>
<tr>
<td>Erratic, reckless, careless, or negligent operation</td>
<td>1</td>
<td>0.1</td>
</tr>
<tr>
<td>Passing with insufficient distance</td>
<td>1</td>
<td>0.1</td>
</tr>
<tr>
<td>Other factors</td>
<td>26</td>
<td>3.1</td>
</tr>
<tr>
<td>None reported</td>
<td>163</td>
<td>19.4</td>
</tr>
<tr>
<td>Unknown</td>
<td>204</td>
<td>24.3</td>
</tr>
<tr>
<td><strong>Total Pedalcyclists</strong></td>
<td><strong>840</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Notes: The sums of the numbers and percentages are greater than total pedalcyclists killed as more than one factor may be present for the same pedalcyclist.

Source: NHTSA, 2016
Pedestrian convicted of vehicular homicide in own child's death

By Elise Hitchcock
The Atlanta Journal-Constitution

A Marietta mother may serve more time than the driver who hit and killed her 4-year-old son.

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Raquel Nelson, 30, could be sentenced to up to 38 months at a hearing July 26, said David Savoy, her attorney. She was convicted Tuesday of homicide by vehicle in the second degree, crossing roadway elsewhere than at crosswalk and reckless conduct, said Savoy.

Jerry L. Guy, the driver who admitted hitting the child when pleading guilty to hit-and-run, served a 6-month sentence. He was released Oct. 29, 2010, and will serve the remainder of a 5-year sentence on probation, according to Cobb court records.
Errors and Violations

Crashes
**Active Failure:** Actions taken by individuals that result in crashes.

**Latent Error:** Dormant conditions that, when combined with active triggers, lead to crashes.
Error-Producing Conditions
Management Decisions and Organizational Processes

Environmental
Error-Producing Conditions

Individual
Errors and Violations

Engineering Defenses

Latent Error Pathway

Crashes
Principles of Safe Systems

1. Human error should not be viewed as the primary cause of crashes.

2. Transportation facilities should be designed for the safety of the most vulnerable user.

3. A shared responsibility exists amongst those who design, build, manage and use roads and vehicles.

4. All parts of the system must be strengthened to multiply their effects; and if one part fails, road users are still protected.
A Model for Creating Safe Systems

Organizational
- Management Decisions and Organizational Processes
- Zoning Ordinances
- Subdivision Regs.
- Regional Development Plans
- Functional Classification
- LOS

Environmental
- Error-Producing Conditions
- Geometric Design
- Traffic Control
- ROW Allocation
  - Bike
  - Ped
  - Transit

Individual
- Errors and Violations
- Education
- Licensure
- Enforcement
- Legal Sanctions

Engineering Defenses
- Passive safety
- Intelligent vehicles
- Traversable hardware

Crashes
Speed Management Program:
New Zealand

OVERLAY BASE INFORMATION
- ONRC
  - Land use
  - Speed limits
  - Current operating speeds

OVERLAY ROAD SAFETY METRICS DERIVED FROM URBAN KIWIRAP:
- Corridor personal risk
- Corridor collective risk

CALCULATE INFRASTRUCTURE RISK RATING

IDENTIFY SAFE AND APPROPRIATE SPEEDS

HIGH BENEFIT FILTER
Divide evenly between big gains and self-explaining, filtering top 2.5% -5% of each by total network length

SAFETY AND EFFICIENCY BENEFITS
- Highest potential to reduce DSI
  - Engineer up
    - Higher ONRC with high risk
    - Justify investment at current or higher speed

CHALLENGING CONVERSATIONS
- High risk but don't meet current performance, unlikely
- Interim lowering of speed limit

CREDIBILITY BENEFITS
- Highest potential public support for speed limit reductions
  - Self-explaining
    - Lower ONRC, travel speeds are already safe and appropriate but below current speed limit
    - Reduce speed limit

OVERLAY
- Transport and growth strategies
- Strategic priorities
- Network operating plans
- Local knowledge
- Community views

SPEED MANAGEMENT PLANNING
- Infrastructure investment
- Targeted enforcement
- Speed limit reviews

ACTIVITY MANAGEMENT PLANNING 2018-21 NLTP
- Monitor, evaluate and review
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